

WHAT IS CLAIMED IS:

1. An active material for an electrode, comprising:
a lithium-containing complex oxide represented by General
5 Formula: $\text{Li}_{1+x+\alpha}\text{Ni}_{(1-x-y+\delta)/2}\text{Mn}_{(1-x-y-\delta)/2}\text{M}_y\text{O}_2$ (where $0 \leq x \leq 0.15$, $-0.05 \leq x+\alpha \leq 0.2$, $0 \leq y \leq 0.4$; $-0.1 \leq \delta \leq 0.1$ (when $0 \leq y \leq 0.2$) or $-0.24 \leq \delta \leq 0.24$ (when $0.2 < y \leq 0.4$); and M is at least one element selected from the group consisting of Mg, Ti, Cr, Fe, Co, Cu, Zn, Al, Ge, Zr and Sn), the lithium-containing complex oxide comprising secondary particles formed of
10 flocculated primary particles,
wherein the primary particles have a mean particle diameter of 0.3 to 3 μm , and
the secondary particles have a mean particle diameter of 5 to 20 μm .
- 15 2. The active material for an electrode according to claim 1, wherein $x \leq 0.05$ and $x+\alpha \leq 0.05$.
- 20 3. The active material for an electrode according to claim 1, wherein in the General Formula, $y > 0$ and M is one or more elements containing at least Co.
- 25 4. The active material for an electrode according to claim 1, wherein the lithium-containing complex oxide has a BET specific surface area of 0.3 to 2 m^2/g .
5. An active material for an electrode, comprising:
a lithium-containing complex oxide A represented by General
Formula: $\text{Li}_{1+x+\alpha}\text{Ni}_{(1-x-y+\delta)/2}\text{Mn}_{(1-x-y-\delta)/2}\text{M}_y\text{O}_2$ (where $0 \leq x \leq 0.15$, $-0.05 \leq x+\alpha \leq 0.2$, $0 \leq y \leq 0.4$; $-0.1 \leq \delta \leq 0.1$ (when $0 \leq y \leq 0.2$) or $-0.24 \leq \delta \leq 0.24$ (when
30 $0.2 < y \leq 0.4$); and M is at least one element selected from the group consisting of Mg, Ti, Cr, Fe, Co, Cu, Zn, Al, Ge, Zr and Sn), the lithium-containing complex oxide A comprising secondary particles formed of flocculated primary particles, the secondary particles having a mean particle diameter of 5 to 20 μm ; and
35 a lithium-containing complex oxide B having a mean particle diameter smaller than the mean particle diameter of the secondary particles of the lithium-containing complex oxide A.

6. The active material for an electrode according to claim 5, wherein $x \leq 0.05$ and $x+\alpha \leq 0.05$.

5 7. The active material for an electrode according to claim 5, wherein the lithium-containing complex oxide B is contained in a ratio of 10% to 40% by weight with respect to a whole of the lithium-containing complex oxide A and the lithium-containing complex oxide B.

10 8. The active material for an electrode according to claim 5, wherein the mean particle diameter of the lithium-containing complex oxide B is not greater than 3/5 of that of the secondary particles of the lithium-containing complex oxide A.

15 9. The active material for an electrode according to claim 5, wherein in the General Formula, $y > 0$ and M is one or more elements containing at least Co.

20 10. The active material for an electrode according to claim 5, wherein the lithium-containing complex oxide A has a BET specific surface area of 0.3 to 2 m²/g.

25 11. The active material for an electrode according to claim 5, wherein the lithium-containing complex oxide B is a complex oxide of secondary particles formed of flocculated primary particles.

12. The active material for an electrode according to claim 5, wherein Ni, Mn and the element M of the lithium-containing complex oxide A have a valence of 2, 4 and 3, respectively.

30 13. The active material for an electrode according to claim 5, wherein the lithium-containing complex oxide B has the same composition as the lithium-containing complex oxide A or is represented by General Formula: Li_{1+a+b}R_{1-a}O₂ (where $0 \leq a \leq 0.05$ and $-0.05 \leq a+b \leq 0.05$, and R is at least 35 one element selected from the group consisting of Mg, Ti, Cr, Fe, Co, Cu, Zn, Al, Ge, Zr and Sn).

14. An active material for an electrode, comprising:

a complex oxide represented by General Formula:

$Li_{1+x+\alpha}Ni_{(1-x-y+\delta)/2}Mn_{(1-x-y-\delta)/2}MyO_2$ (where $0 \leq x \leq 0.15$, $-0.05 \leq x+\alpha \leq 0.2$, $0 \leq y \leq 0.4$; $-0.1 \leq \delta \leq 0.1$ (when $0 \leq y \leq 0.2$) or $-0.24 \leq \delta \leq 0.24$ (when $0.2 < y \leq 0.4$); and M is at least one element selected from the group consisting of Mg, Ti, Cr, Fe, Co, Cu, Zn, Al, Ge, Zr and Sn), the complex oxide comprising secondary particles formed of flocculated primary particles,

5 wherein the secondary particles having a mean particle diameter of 5 to 20 μm are contained in a ratio of 60% to 90% by weight with respect to a whole of the complex oxide, and

10 the secondary particles having a mean particle diameter of not greater than 3/5 of the mean particle diameter of 5 to 20 μm are contained in a ratio of 10% to 40% by weight with respect to the whole of the complex oxide.

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15. The active material for an electrode according to claim 14, wherein $x \leq 0.05$ and $x+\alpha \leq 0.05$.

16. A non-aqueous secondary battery comprising:

20 a positive electrode comprising a lithium-containing complex oxide as an active material;

a negative electrode; and

a non-aqueous electrolyte;

wherein the lithium-containing complex oxide is represented by
25 General Formula: $Li_{1+x+\alpha}Ni_{(1-x-y+\delta)/2}Mn_{(1-x-y-\delta)/2}MyO_2$ (where $0 \leq x \leq 0.15$, $-0.05 \leq x+\alpha \leq 0.2$, $0 \leq y \leq 0.4$; $-0.1 \leq \delta \leq 0.1$ (when $0 \leq y \leq 0.2$) or $-0.24 \leq \delta \leq 0.24$ (when $0.2 < y \leq 0.4$); and M is at least one element selected from the group consisting of Mg, Ti, Cr, Fe, Co, Cu, Zn, Al, Ge, Zr and Sn) and comprises secondary particles formed of flocculated primary particles,

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the primary particles have a mean particle diameter of 0.3 to 3 μm , and

the secondary particles have a mean particle diameter of 5 to 20 μm .

17. The non-aqueous secondary battery according to claim 16, wherein x

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≤ 0.05 and $x+\alpha \leq 0.05$.

18. The non-aqueous secondary battery according to claim 16, wherein

in the General Formula, $y > 0$ and M is one or more elements containing at least Co.

19. The non-aqueous secondary battery according to claim 16, wherein
5 the lithium-containing complex oxide has a BET specific surface area of 0.3 to 2 m²/g.
20. A non-aqueous secondary battery comprising:
10 a positive electrode comprising a lithium-containing complex oxide as an active material;
a negative electrode; and
a non-aqueous electrolyte;
wherein the lithium-containing complex oxide comprises
15 a lithium-containing complex oxide A represented by
General Formula: $\text{Li}_{1+x+\alpha}\text{Ni}_{(1-x-y+\delta)/2}\text{Mn}_{(1-x-y-\delta)/2}\text{M}_y\text{O}_2$ (where $0 \leq x \leq 0.15$, $-0.05 \leq x+\alpha \leq 0.2$, $0 \leq y \leq 0.4$; $-0.1 \leq \delta \leq 0.1$ (when $0 \leq y \leq 0.2$) or $-0.24 \leq \delta \leq 0.24$ (when $0.2 < y \leq 0.4$); and M is at least one element selected from the group consisting of Mg, Ti, Cr, Fe, Co, Cu, Zn, Al, Ge, Zr and Sn), the lithium-containing complex oxide A comprising secondary particles formed
20 of flocculated primary particles, the secondary particles having a mean particle diameter of 5 to 20 µm, and
a lithium-containing complex oxide B having a mean particle diameter smaller than the mean particle diameter of the secondary particles of the lithium-containing complex oxide A.
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21. The non-aqueous secondary battery according to claim 20, wherein $x \leq 0.05$ and $x+\alpha \leq 0.05$.
22. The non-aqueous secondary battery according to claim 20, wherein
30 the lithium-containing complex oxide B is contained in a ratio of 10% to 40% by weight with respect to a whole of the lithium-containing complex oxide A and the lithium-containing complex oxide B.
23. The non-aqueous secondary battery according to claim 20, wherein
35 the mean particle diameter of the lithium-containing complex oxide B is not greater than 3/5 of that of the secondary particles of the lithium-containing complex oxide A.

24. The non-aqueous secondary battery according to claim 20, wherein in the General Formula, $y > 0$ and M is one or more elements containing at least Co.

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25. The non-aqueous secondary battery according to claim 20, wherein the lithium-containing complex oxide A has a BET specific surface area of 0.3 to 2 m²/g.

10 26. The non-aqueous secondary battery according to claim 20, wherein the lithium-containing complex oxide B is a complex oxide of secondary particles formed of flocculated primary particles.

15 27. The non-aqueous secondary battery according to claim 20, wherein the lithium-containing complex oxide B has the same composition as the lithium-containing complex oxide A or is represented by General Formula: Li_{1+a+b}R_{1-a}O₂ (where 0 ≤ a ≤ 0.05 and -0.05 ≤ a+b ≤ 0.05, and R is at least one element selected from the group consisting of Mg, Ti, Cr, Fe, Co, Cu, Zn, Al, Ge, Zr and Sn).

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28. The non-aqueous secondary battery according to claim 20, wherein Ni, Mn and the element M of the lithium-containing complex oxide A have a valence of 2, 4 and 3, respectively.

25 29. A non-aqueous secondary battery comprising:
a positive electrode comprising a lithium-containing complex oxide as an active material;
a negative electrode; and
a non-aqueous electrolyte;
30 wherein the lithium-containing complex oxide is a complex oxide represented by General Formula: Li_{1+x+α}Ni_{(1-x-y+δ)/2}Mn_{(1-x-y-δ)/2}M_yO₂ (where 0 ≤ x ≤ 0.15, -0.05 ≤ x+α ≤ 0.2, 0 ≤ y ≤ 0.4; -0.1 ≤ δ ≤ 0.1 (when 0 ≤ y ≤ 0.2) or -0.24 ≤ δ ≤ 0.24 (when 0.2 < y ≤ 0.4); and M is at least one element selected from the group consisting of Mg, Ti, Cr, Fe, Co, Cu, Zn, Al, Ge, Zr and Sn),
35 the complex oxide comprising secondary particles formed of flocculated primary particles,

the secondary particles having a mean particle diameter of 5 to 20

μm are contained in a ratio of 60% to 90% by weight with respect to a whole of the complex oxide, and

the secondary particles having a mean particle diameter of not greater than 3/5 of the mean particle diameter of 5 to 20 μm are contained
5 in a ratio of 10% to 40% by weight with respect to the whole of the complex oxide.

30. The non-aqueous secondary battery according to claim 29, wherein $x \leq 0.05$ and $x+\alpha \leq 0.05$.

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